

GEOGRAPHIC VARIATION IN THE BARASINGHA OR SWAMP DEER (*CERVUS DUVAUCELI*)¹

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(With five plates & four-text-figures)

The Barasingha or Swamp Deer, *C. devauceli*, is revised; a new subspecies is described from Assam. Adaptations and relationships of the species are briefly reviewed.

The Barasingha or Swamp Deer (*Cervus duvauceli*) was reputedly spread widely in Northern India and southern Nepal in historic times. Lydekker (1907) gives the distribution from the Assam valley in the east to the Kyarda Dun in the west, and from the foot of the Himalaya south to the Godavari river; with a few outliers in the Sunderbans to the east and on the Indus to the west. North of the Ganges it would be restricted to swampy grasslands; south of it, to Sal forest. Today the species is reduced to three small pockets: the Nepal-India border in the Kumaun-Kanchanpur-Dudhwa-Kheri region; a few sanctuaries in Assam (Manas, Orang and Kaziranga); and the Kanha National Park, near Mandla, Madhya Pradesh. The only recent record outside these three areas is for the Chitawan district of Nepal; Schaller (1967) quotes R. Willan to the effect that "a few" occur there, but they are extinct there today (A. Laurie, *pers. comm.*). It seems probable that the species was always restricted to pockets of suitable country, such that local extermination was relatively easy.

Since the work of Pocock (1943), the species has been divided into two subspecies:

C. d. duvauceli, the true Swamp Deer from north of the Ganges, and *C. d. branderi*, the Hard-ground Barasingha from between the Ganges and Godavari rivers. Apart from the hooves — splaying, with bare pasterns in the former, and hard-knit with normally haired pasterns in the latter — the differences between the two have always been a little vague, due in part to the changes with sex and season, in part to lack of familiarity with living specimens.

Both the Assam and the Nepal/U.P. populations have customarily been assigned to the nominate subspecies, *C. d. duvauceli*; but M. K. Ranjitsinh (*in epist.*, 1979, 1980) has noted that they differ strongly from one another, and suggested to me that it might be worthwhile to investigate the possibility that they differ subspecifically.

MATERIAL AND METHODS

Skulls and antlers of this species were examined and measured in the following institutions: British Museum (Natural History); Powell-Cotton Museum, Birchington, Kent; Bombay Natural History Society; Van Ingen & Van Ingen, Mysore; Indian Forestry College, Dehra Dun; and the private collections at the palaces of H. H. the Maharana Saheb of Wankaner and H. H. the Maharaja of

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Fig. 5. Skull of *C. d. duvauceli*, BM 12.10.31.6, from Kheri.
(Photo: M. K. Ranjitsinh)



Above: Fig. 6. Herd of *C. d. duvauceli*: Kishanpur Sanctuary, Pilibit district, U.P.
Below: Fig. 8. *C. d. ranjitsinhi* in Kaziranga National Park, Assam.
(Photo: M. K. Ranjitsinh)

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TABLE

MEASUREMENTS OF SKULLS (ALL MALE) AND ANTLERS *Cervus duvauceli*

	<i>C. d. duvauceli</i>			<i>C. d. ranjitsinhi</i>			<i>C. d. branderi</i>					
	Kumaun			Kheri			Assam			M.P.		
	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n
Greatest skull length	377.0	6.24	3	393.2	7.49	6	388.7	10.26	3	366.7	6.11	3
Nasal length	129.7	9.07	3	130.5	8.55	6	138.3	9.29	3	127.5	—	2
Nose depth	52.3	4.16	3	53.8	4.92	5	57.7	2.08	3	50.0	—	2
Snout length	132.3	2.89	3	132.6	5.94	5	125.0	—	2	114.5	—	2
Antler length	686.4	13.43	5	675.1	39.79	8	626.0	58.62	3	706.8	39.39	5
Burr to brow tine	47.6	9.61	5	57.5	8.00	8	58.3	15.00	3	58.8	12.89	5
Brow tine to main fork	381.0	57.69	5	361.5	47.47	8	332.3	28.36	3	402.4	49.53	5
Length of brow tine	239.8	26.98	5	306.9	37.96	8	233.0	89.11	3	299.8	35.51	5
Length of anterior branch	306.0	42.95	5	309.9	46.65	8	263.3	43.66	3	345.6	39.48	5
Length of posterior branch	278.8	53.66	5	276.9	42.23	8	241.3	69.00	3	264.2	35.79	5

Kolhapur. With one exception, all skulls in the collection are male.

The skull measurements taken were mostly those of Lowe & Gardiner (1974). Standardisation of skull measurements within restricted groups of vertebrates is very desirable, and I would like to take this opportunity to recommend that future workers on the Cervidae follow the Lowe & Gardiner method, which seems to describe all major parameters of skull variation. A few measurements were also taken on antlers and their pedicels: both antero-posterior and transverse diameters of pedicels and of the antlers themselves between burr and brow-tine; and lengths of tines and distances between branching-points. It should be noted that the point of measurement on the antler was always the centre of the node, i.e. the triradius where the longitudinal grain of the tine meets the ascending and descending grains of the beam.

RESULTS

The skulls and antlers studied were assignable to four main geographic samples:

Kumaun, Kheri (Sarda river, Pilibit, Sonaripore, Bahraich), Assam (including Gauhati), and Madhya Pradesh. Under this latter heading are included specimens from the Mandla district, where the species still survives; from Junga (approx. 20°N., 82°20'E.); and from "Dewas", (probably the Dewas district some 400 km west of Mandla). Two skulls from Nanpara and two from "Nepal" were studied in addition.

Samples differed from one another in absolute skull size, as measured by greatest length; nasal length (Lowe & Gardiner, 1974: 200, Appendix I, measurement no. 7); nose depth (Lowe & Gardiner no. 15); snout length (Lowe & Gardiner no. 5); minimum maxilla breadth (Lowe & Gardiner no. 9); antler length; length of brow-tine; and distances between branching points of antlers. These measurements are listed, with means and standard deviations for each of the four samples, in the Table; and depicted in bivariate plots in Figs. 1-4.

The Kumaun and Kheri samples differ in two features only: absolute size, and length

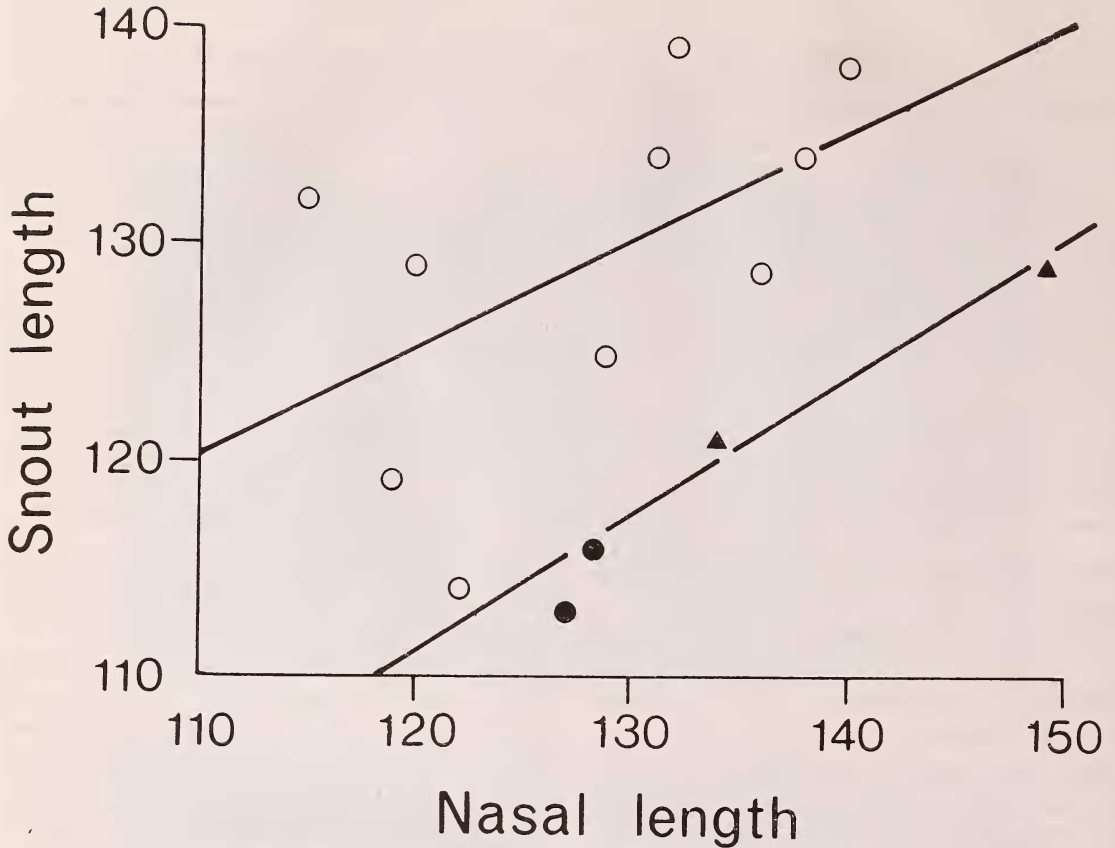


Fig. 1. Plot of Nasal Length vs. Snout Length (Lowe & Gardiner, 1974, nos. 7 vs. 5). Regression equations as follows:

<i>C. d. duvauceli</i> :	$y = 63.77 + 0.511 x$ ($r = .555$)
<i>C. d. ranjitsinhi + branderi</i> :	$y = 29.00 + 0.675 x$ ($r = .979$)

of brow-tine. Although the size difference is quite marked, known environmental responses in the growth of deer (Huxley, 1931; Hoogerwerf, 1956) suggest extreme caution before assuming a genetic basis for this. Brow tine length, though again quite strongly different on average in the two, overlaps when observed ranges are considered, and the standard deviation limits nearly overlap.

The two Nanpara skulls are 373 and 385 mm long respectively; they are thus within the

Kumaun size range, although separated from the Kumaun area by the Kheri region. This clearly identifies the size difference as of strictly limited significance: a microgeographic phenomenon, whether genetic or environmental. Brow-tine lengths are 305 mm in both, nearly identical to the Kheri mean, indicating in this case a rather clearer geographic trend. An adult skull from "Nepal" in the British Museum is 397 mm long with a brow-tine of 340, both characters aligning it with Kheri;

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but the exact locality in Nepal is unknown. The second Nepal specimen, the type of *Cervus dimorphe* Hodgson, is a young adult of 364 mm, with deformed antlers: it was reared in captivity for at least a year (Hodgson 1843), and is doubtless stunted.

Assam skulls are between the two above

samples in size, but with long nasals, deep muzzle, short snout, short antlers branching low down, and short brow-tine. While none of these differences by itself quite reaches the conventional level of subspecific differentiation (75% rule), the bivariate plots throw the shape differences into relief. The nasals are very long

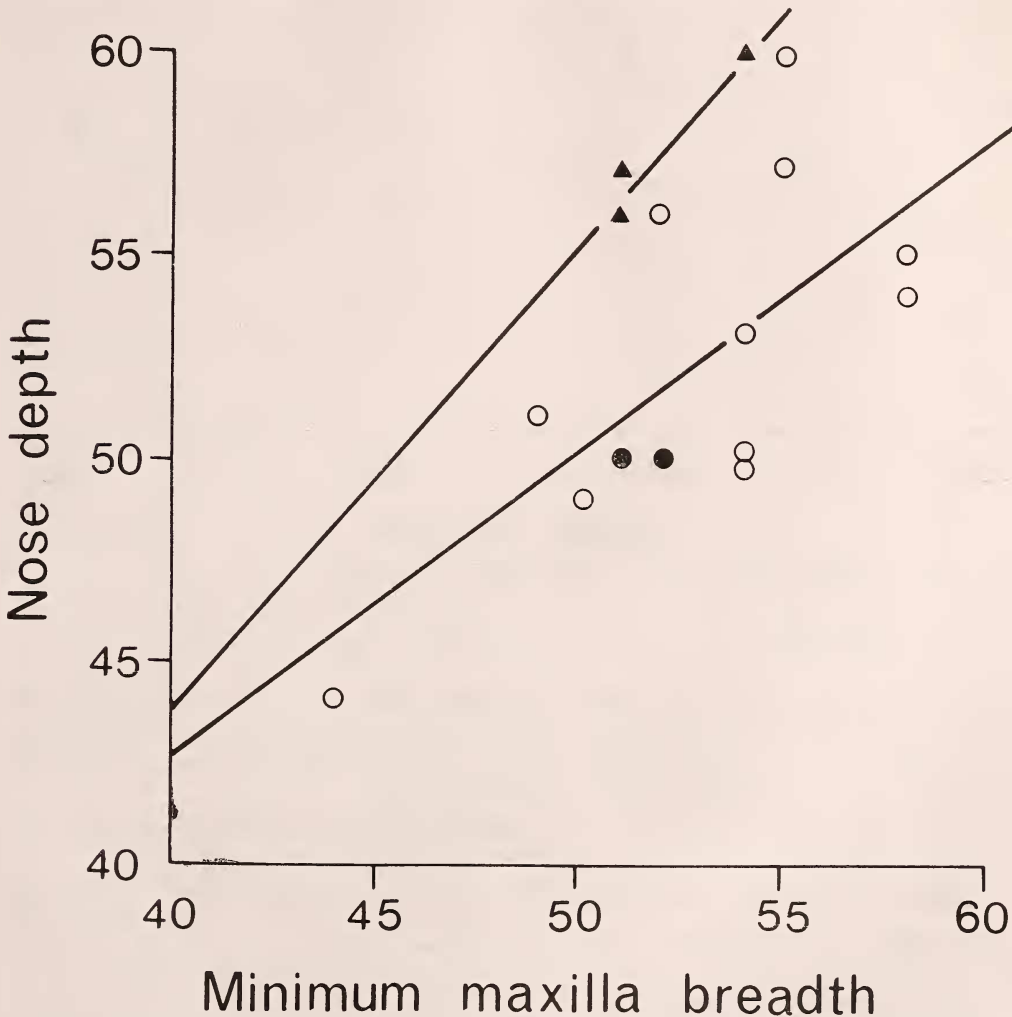


Fig. 2. Plot of Nose Depth vs. Minimum maxilla breadth (Lowe & Gardiner, 1974, nos. 15 vs. 9). Regression equations as follows:

C. d. duvauceli:

$$y = 11.94 + 0.767 x \quad (r = .710)$$

C. d. ranjitsinhi:

$$y = -3.00 + 1.167 x \quad (r = .971)$$

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1868 *Cervus eucladoceros* Falconer. South of Hardwar.

Specimens seen. Kumaun 5 [BM(NH) 3, IFC 2], Nanpara 2 (Van Ingen), Pilibit 2 (Wankaner), Kheri 8 [BM(NH)], Nepal 2 [BM(NH)].

Diagnosis: Nasals short relative to snout length, nose not deep, antlers long, slender, not compressed or palmated (Fig. 5).

Description. Observations of living herds show that the hinds are very large in this form,

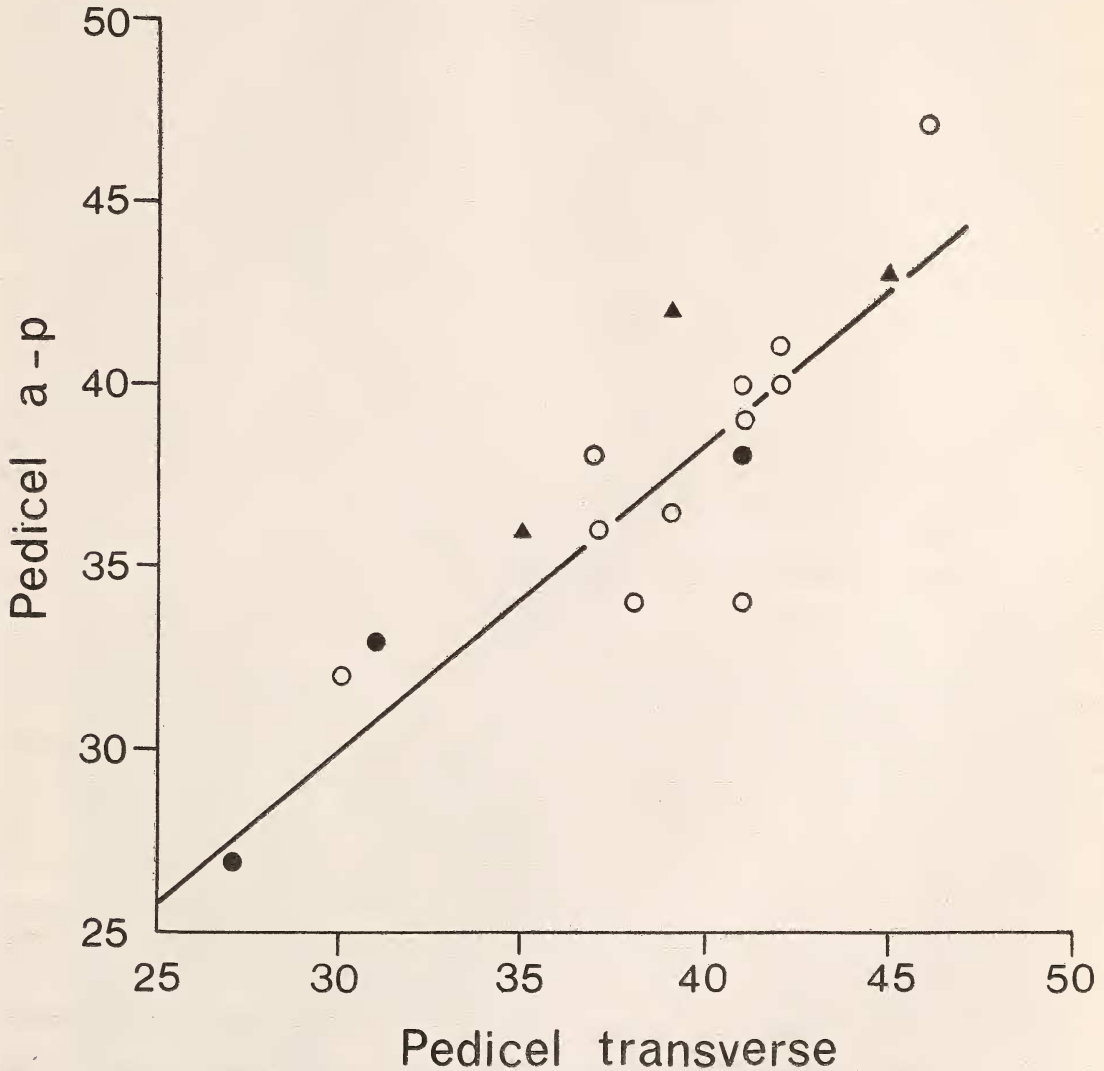


Fig. 4. Plot of Pedicel diameters: transverse vs. antero-posterior. Regressions of:

C. d. duvauceli:
C. d. ranjitsinhi:
C. d. branderi:

$y = 5.24 + 0.829 x$ ($r = .83$)
 $y = 14.24 + 0.678 x$ ($r = .875$)
 $y = 8.55 + 0.731 x$ ($r = .957$)

comparable in size with the stags, and with a thicker neck; the tail in both sexes is relatively long and slim with prominent white hair on the undersurface; the ears are very large and rounded, with a thick growth of white hair on the inside. Fig. 6 shows some of these features; good close-up photos can be found in Schaaf (1979). The Kheri sample is, as mentioned above, slightly differentiated from the Kumaun one: by its large size (perhaps not a genetic character) and elongated brow-tine. The Nanpara specimens are smaller again, but have the same long brow-tine; they possibly represent the same population as the now extinct Chitawan barasingha.

None of the names in the above synonymy is very firmly based; and only *Cervus dimorphe* appears to be represented by a type specimen, which is a young adult skull with antlers deformed by captivity. On historical grounds there is no probability that any of the names apply to the Assam valley race, which thus needs a new name.

Cervus duvauceli ranjitsinhi subsp. nov.
Eastern Swamp Deer or Barasingha

Type. British Museum (Natural History) 91.2.7.9, skull with antlers, from Gauhati, Assam, presented by A. O. Hume in 1891. The skull is mounted on a display shield, and the basicranium has been cut off to mount it.

Referred specimens. (1) BM(NH) 23.10.5.54, "Assam", skull with antlers, the anterior maxillae and premaxillae missing. (2) BM(NH) 12.10.31.5, Gauhati.

Origin of name. For M. K. Ranjitsinh, presently Secretary of the Forest Department, State of Madhya Pradesh, India. Ranjitsinh's name has been associated with many wildlife conservation projects in India, and recently in Thailand; in the late 1960s his insistence and energy was primarily responsible for reviving *C. d. branderi* from near extinction, and he

has more recently been concerned in the still more difficult problem of saving the Manipur Thamin (*C. eldi eldi*).

Diagnosis. Compared with the nominate race, distinguished by its elongated nasals and short deep snout; short thick antlers, branching low down, with especially shortened anterior branch; antlers somewhat compressed and tend to be palmated (Fig. 7).

Description. M. K. Ranjitsinh (*in press; in litt.*, 4.8.1980 and 2.9.1980) points out that in the field this race is heavily built, but linearly of the same height as *C. d. branderi*, i.e. smaller than the nominate race and with the hinds especially small; the muzzle is more slender from side to side and pointed, giving the impression of being more elongated; the ears, which have very little white hair on the insides unlike the other two races, are smaller, less rounded and distinctly pointed; the tail is shorter; and in moult the white spots in the mid-dorsal region are much less prominent. These features are clearly visible in Figs. 8 and 9, as are the short, flattened, low-branching, somewhat palmated antlers, highly characteristic in the field. The feet are splayed with bare "heels", as in the nominate race, as far as is known.

Notes. Although for comparative purposes the small number of specimens is to be regretted, collection of further specimens is clearly undesirable at this time. From a conservation point of view the identification of this new subspecies is of the greatest urgency.

Cervus duvauceli branderi Pocock. Southern Swamp Deer; Hard-ground Barasingha

1943 *Rucervus duvauceli branderi* Pocock. Mandla.

Specimens seen. "Central Provinces" 2 [BM (NH)], Mandla 3 [holotype, BM(NH); Wankaner, 2], Junga 1 (Powell-Cotton Museum), Dewas 2 (Kolhapur).



Fig. 7. Skull of *C. d. ranjitsinhi*, BM 91.8.7.9, from Gauhati (Holotype).
(Photo: M. K. Ranjitsinh)